

# Notes on the Systematics and Distribution of some Swiftlets (Collocalia) of Malaysia and adjacent subregions

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Systematic: *Collocalia lowi robinsoni*, subsp. nov.

The taxonomy of the so-called "grey" swiftlets of the genus *Collocalia* (i.e., of the species of *Collocalia* with the exception of *Collocalia esculenta*) is of a special interest from more than one point of view. Being inhabitants of caves, these birds depend on narrowly limited ecological conditions:—on the presence of suitable caves in which they can build their nests. The distribution of such breeding places is a very irregular one; in some regions they are to be found close together, in others they are lacking over vast areas. In spite of the excellent flying powers of these swiftlets the radius of their activity does not seem to be very great; and a mingling of the populations may only occur with any frequently in regions which contain many caves. This circumstance is suitable for accelerating the genesis of races and of species. Gradual transformation and development takes place, however, in very narrow limits, the surrounding in which these birds live being nearly the same everywhere:—the air in which they catch their flying prey and the dark crevices and caves in which they spend the night and rear the young. Their eyes seem to be built like those of the nightbirds, i.e., the *Striges* and *Caprimulgi*, for the appreciation of light and dark, but not for bright colours, and the rods of the retina are probably very much more frequent than the cones. Signals for recognition of the members of the same species are therefore not bright colours, but only the silhouette, the size, the movements in flight and perhaps also the contrast between dark and light. This is probably the reason why the whole group is divided into several species, the discrimination of which is of the greatest difficulty. In this case the systematist has to work with great minuteness. The study of the skin alone is not sufficient; in no other group is the systematist so anxious to know something of the osteology and the breeding history to support his arguments but this is in general a hope for the future: at present one has to try to make decisions without this valuable help and only with the aid of skins.

The principal aim must be not only to distinguish the several species which live in the same region, but also to discover how far these species are distributed and in which respect they vary geographically. But this latter aim cannot be reached without much difficult study, some of the species resembling each other so

closely that they would be called geographical races if it were not known that they live together at the same place or even in the same cave.

Some of the species are without doubt very widely distributed. This is proved by *Collocalia esculenta*, which ranges from the Andamans and the Mergui Archipelago eastward as far as the Solomon Islands. It is probable, therefore, that other species also have a great distribution. This has been maintained in former times for *C. francica* and *C. fuciphaga*. I hold this view with regard to *C. francica*, but I am not sure if it is right also for *C. fuciphaga*. It is very convenient to treat all the forms of *Collocalia* which follow *francica* immediately in increasing size as races of *fuciphaga*. But one has to consider the possibility that this opinion may be wrong and that the birds united under the specific name *C. fuciphaga* are of polyphyletic origin. Even more obscure is the inter-relation between the forms which are bigger than the species *C. fuciphaga*. If we take away from this group the very well defined *C. gigas*, there remains a certain number of easily distinguishable forms, which I united in 1926 under the name *C. brevirostris*. Since that time, however, I have become doubtful as to the correctness of my former view, and I prefer now to split up the unit into several species, the relations of which have still to be studied with greater preciseness.

The Collocalias deserve our interest also from a second point of view, namely because of their economical importance. The importance of the nests of these swiftlets among the exports from the Malay Archipelago is proved by the fact that the value of the nests exported in 1902 from the area of Dutch East India amounted to 223,990 Guilders (Encyclopaedie van Nederlandsch Indie, Bd. 4, 1906, p. 584), a figure which is probably much too low and to which has to be added the great export from the British and French Colonies and the Philippines, if one wants to know the total value of the nests which are annually introduced into China.

Which species of *Collocalia* produces the white nests which are of such a high commercial value? Until recently they have been generally, but wrongly, ascribed to *C. fuciphaga*. It appears more and more, that the real producer of these valuable nests is *C. francica*, or rather its western races. All the bigger species produce so-called black nests without value, the attribute "black" being given to them because the mass of hardened saliva is not pure, but more or less mixed with feathers, moss, flying seeds and other material. Therefore it is not only of scientific interest, but also of economic importance to know how to distinguish the different species of *Collocalia* and to study their biology. This knowledge would give the basis for any attempt to increase the production of that important trade article, the nest.

### Material and Methods

**Material.**—The impetus to study again these birds came from Messrs. C. Boden Kloss and F. N. Chasen, who have been kind enough to send me the very considerable material which the Raffles Museum has from the Malay Peninsula and from Northern Borneo. This material has been supplemented through the kindness of the authorities of the Tring Museum and of Prof. de Beaufort, who sent me specimens from Sumatra; I am also obliged to Prof. E. D. van Oort for the loan of specimens collected by E. Jacobson in Sumatra and now kept in the Leiden Museum. Since my last revision (1925), the material of the Berlin Museum, too, has been not inconsiderably enlarged. With all this, my conclusions now have broader foundations than they had before and I have been constrained to alter my former views on several points (e.g., with regard to the classification of *Collocalia micans* Stres., *C. innominata* Hume, *C. sororum* Stres., etc.).

**Methods.**—In my former paper I restricted myself to giving the wing measurements and sometimes also those of the tail to characterize the species and the races. During my present investigation, however, I became aware of the great taxonomical importance of the bifurcation of the tail, a point which A. O. Hume had already emphasized. It became more and more apparent that at least some of the species are distinguished from each other by the fact that in some the tail is nearly square, while in others the outer tail-feathers are much longer than the central pair. Therefore I give in each case, besides the length of the wing, two measurements of the tail, (i) the length of the central pair, (ii) the length of the longest pair of rectrices. In both cases I took as the proximal point of measurement the place where the calami of the central pair leave the skin. To realize the great importance of this method it will be sufficient to compare the tables for *C. fuciphaga* and *C. francica javensis*, or for *C. francica vestita* and *C. lowi lowi*. In these tables I include only such specimens which seem to of special interest, by preference series from the same locality.

To facilitate the comparison with some of my former papers on *Collocalia*, I quote them with the following abbreviations:—

**Stres. I.** = Erwin Stresemann, "Was ist *Collocalia fuciphaga* (Thunberg)?", Verh. Orn. Gesellsch. Bayern. XII, 1 (1914), p. 1-12.

**Stres. II.** = Erwin Stresemann, "Bruchstücke einer Revision der Salanganen (*Collocalia*)", Mitt. Zool. Mus., Berl., XII, 1 (1925), p. 179-190.

**Stres. III.** = Erwin Stresemann, "Bruchstücke einer Revision der Salanganen (*Collocalia*)", II, Mitt. Zool. Mus., Berl., XII, 2 (1926), p. 349-354.

I. *Collocalia francica*.

This is (leaving aside *C. sororum*) the smallest and at the same time the most widely distributed of the "grey" Collocalias. It is a true inhabitant of caves, but it seems to be not quite so light-shunning as the bigger species. In Java at least it has for some time now been found breeding in the lofts of old European buildings.

This species is divided into many geographical races. Some of them only produce valuable "white" nests, while others mix so much vegetable matter with the saliva that the nests are without any commercial value. It is important to know the producers of valuable nests; they are the following races: *germani*, *inexpectata*, *vestita*, *javensis*, *micans*, and perhaps some more neighbouring forms. This means that the habitat of Collocalias producing white nests extends from the Andamans, the Mergui Archipelago, Cochinchina and Luzon as far south as the Greater and Lesser Sunda Islands. There exist, as far as I know, no *francica* races of commercial importance to the east of Celebes. The nests of the western *francica* races, which are made entirely of saliva, seem to contain as a rule not one, but two eggs.

The geographical variation is in the west not very significant as regards morphology. The size varies somewhat. The smallest birds seem to live in Java (*javensis*, wing 109–117 mm.), the largest in North Borneo (*vestita*, wing 115–127 mm.). Also the amount of feathering on the tarsus varies geographically. Some races are always devoid of feathers, in others the tarsi are nearly always more or less feathered. In some races the upper and undersides are darker than in others, the gloss of the former varying from bluish to greenish in colour. The most conspicuous feature is the colour of the rump, which contrasts in one extreme with the back as a greyish white band (*germani*) while it is absolutely concolorous with the back in the other (*vestita*), the extremes being linked by intermediate races. *C. vestita* with its dark rump is surrounded by races with lighter rumps.

Of diagnostical value in comparison with other species of *Collocalia* are the small size and the relatively long and much furcated tail.

*Collocalia francica germani*, Oustalet.

Synonym. *Collocalia francica merguiensis*, Hartert, 1892 (Mergui Archipelago)—*Collocalia francica germani*, Stres., II, p. 183.

*Diagnosis*.—Tarsus always without feathers; underside lighter than in *C. f. vestita*; upperside lighter and more greenish, less bluish than in *C. f. vestita*, rump as a rule much lighter than the back, whitish-grey with blackish shafts.

*Distribution*.—Mergui Archipelago, coasts of Tenasserim, Peninsular Siam and the Malay States to the south nearly as far as Johore; coasts of Cochinchina (Pulo Condor, etc.).

*Measurements*.—A series in the Raffles Museum from the island of Koh Pennan, east coast of Peninsular Siam, collected May 27th to June 29th, 1913, by H. C. Robinson and E. Seimund,\* measures:—

| Sex | Wing    | Shortest Rectrix | Longest Rectrix |
|-----|---------|------------------|-----------------|
| ♂   | 113     | 43               | 50              |
| ♀   | 117     | 43               | 50              |
| ♀   | 117     | 43               | 50              |
| ♂   | 118     | 44               | 51              |
| ♀   | 118     | 45               | 52              |
| ♂   | 119     | 46               | 53              |
| ♂   | 120     | 45               | 50              |
| ♂   | 120     | 46               | 51.5            |
| ♀   | 120     | 44               | 51              |
| ♂   | 121     | 44               | 50              |
|     | 113–121 | 43–46            | 50–53           |

*Collocalia francica inexpectata*, Hume.

*Collocalia francica inexpectata*, Stres., II, p. 183.

*Diagnosis*.—Very similar to *C. f. germani*, but rump as a rule (not always) darker; tarsus always naked.

*Distribution*.—Andaman and Nicobar Islands.

*Measurements*.—Wing 114–120 mm.

*Collocalia francica germani* > < *vestita*.

*Collocalia francica amechana*, Oberholser, 1912, Anamba Islands.

*Distribution*.—Southernmost portion of the Malay Peninsula. Anamba Islands in the South China Sea, and probably adjacent areas. In this region *C. f. germani* merges into *vestita*. The individual variation is great in some localities, specimens with dark rumps being found together with light rumped ones, and some specimens having naked, others feathered tarsi. Birds from Singapore Island have mostly a very great similarity with the Javanese *C. f. javensis*.

\**Collocalia merguiensis*, Robinson, Journ. Fed. Malay States Mus., V, 1914, p. 146.

*Measurements.*—A series from Singapore Island in the Raffles Museum, collected 14th and 15th January, 1931 by F. N. Chasen, measures:—

| Sex | Wing      | Shortest Rectrix | Longest Rectrix |
|-----|-----------|------------------|-----------------|
| ♀   | 113       | 41               | 47              |
| ♂   | 115       | 45               | 52              |
| ♂   | 115       | 44               | 51              |
| ♂   | 116       | 45               | 52              |
| ♂   | 117       | 46               | 50              |
| ♂   | 117       | 45.5             | 52              |
| ♂   | 117       | 43               | 49              |
| ♂   | 118       | 45               | 52              |
|     | 113 - 118 | 41 - 46          | 47 - 52         |

***Collocalia francica vestita* (Lesson).**

*Salangana vestita*, Lesson, 1843 (Sumatra); *Collocalia nidifica*, Gray, 1845 (Sumatra).

Probable Synonyms. *C. fuciphaga mearnsi* Oberholser, 1912 (Luzon); *C. fuciphaga aerophila*, Oberholser, 1912 (Nias); *C. fuciphaga natunae*, Stres., 1930 (Great Natuna); *C. fuciphaga fuciphaga* (nec Thunberg) Robinson and Kloss, Journ. Fed. Malay States Mus., XI, 1924, p. 243 (Sumatra); *C. francica mearnsi, aerophila* and *vestita* pt., Stres., II, p. 183, 184.

*Diagnosis.*—Tarsus more or less feathered, rarely quite devoid of feathers. Upper and underside darker than in *germani* and *javensis* and with more bluish, less greenish gloss; rump as a rule of the same colour as the back.

*Distribution.*—Sumatra, Simalur, Nias, Sipora, Borneo, Palawan, Luzon.

*Measurements.*—With regard to the length of the wing this form could be divided into at least two ill-defined races, but I prefer to refrain from distinguishing them by name. The biggest specimens live in N. W. and N. Borneo and on the Natuna Islands: wing 115 to 127 mm. ("*natunae* Stres."). The smallest are apparently the birds from S. E. Borneo; wing 113 to 116 mm.

*Sumatra:* Ophir district, E. Jacobson leg., in Leiden Museum:—

|                     |     |         |       |      |    |
|---------------------|-----|---------|-------|------|----|
| Muara Kiawai ...    | ... | 23-5-15 | 116   | 47   | 51 |
| Sukamenanti ...     | ... | 22-6-17 | 116.5 | 44   | 48 |
| G. Talamau 400 m.   | ... | 27-6-17 | 118   | 43   | 48 |
| G. Talamau 2,800 m. | ... | 7-6-17  | 119   | 48.5 | 52 |

*Sumatra:* Deli district, Toentoengan, van Heyst leg., in Amsterdam Museum:—

|   |         |     |      |      |
|---|---------|-----|------|------|
| ♂ | 26-9-19 | 121 | 44†x | 47†x |
| ♀ | 2-9-19  | 122 | 47   | 50   |

*Sipora:* Modigliani leg., in Tring Museum:—

|  |     |    |    |
|--|-----|----|----|
|  | 116 | 44 | 49 |
|--|-----|----|----|

*S. E. Borneo:* Cave Tamaluang, 4-3-26, G. Tichelman leg., in Berlin Museum:—

|       |      |    |         |
|-------|------|----|---------|
| 113   | 44   | 49 | (26.38) |
| 114   | —    | —  | (26.33) |
| 114.5 | —    | —  | (26.34) |
| 115   | 43   | 48 | (26.35) |
| 115   | 45   | 50 | (26.36) |
| 116   | 44.5 | 51 | (26.37) |

*North Borneo:* East coast, in Raffles Museum:—

|   |     |    |          |
|---|-----|----|----------|
| ♂ | 115 | 42 | 46       |
| ♂ | 117 | 43 | 49       |
| ♀ | 119 | 45 | 48 (269) |
| ♀ | 120 | 45 | 49 (44)  |
| ♀ | 123 | 42 | 48 (246) |
| ♂ | 123 | 44 | 50 (219) |
| ♂ | 123 | 45 | 50 (320) |
| ♂ | 124 | 48 | 51 (249) |
| ♂ | 125 | 44 | 48 (259) |
| ♂ | 127 | 44 | 50 (41)  |

*Great Natuna:* Mt. Ranai, Ch. Hose leg. 1894, in Tring Museum:—

|   |     |    |    |
|---|-----|----|----|
| ♂ | 119 | 42 | 45 |
| ♀ | 125 | 47 | 51 |
| ♂ | 125 | 43 | 47 |
| ♀ | 126 | 46 | 48 |

***Collocalia francica javensis* subsp. nov.**

*Type.*—In Zoological Museum, Berlin, No. 27, 1186: ♂ Cheribon (Java), 6th October, 1927, J. J. Menden leg.

*Collocalia vestita vestita* (nec Lesson), Stres. I, p. 5; *Collocalia francica vestita* (nec Lesson), Stres. II, p. 183.

*Diagnosis.*—Upperside paler and more greenish than in *vestita*, not so bluish, rump a little paler than back, but by no means as light as in *germani*; underside darker than in *germani*; tarsus more or less feathered.

*Distribution*.—Java, Kangean Is., Flores and probably all the Lesser Sunda Islands between Java and Flores.

*Observation*.—In my previous papers I called the Javanese race provisionally *Collocalia francica vestita*, having not been in the position to examine material from Sumatra. It appears now that the true *vestita* from Sumatra is identical with the race from Borneo which I formerly distinguished as *C. f. mearnsi*, while the Javanese form can be easily distinguished. The latter is very similar to the birds which breed in the southernmost part of the Malay Peninsula and which form a transition between *germani* and *vestita*. A single specimen from Kangean has no feathers on the tarsus (and was for this reason determined by myself, I, p. 5, as *C. fuciphaga*), but in other respects it agrees well with Javanese specimens. The only skin from Flores has a very pale rump and agrees in this respect with *germani*, but the tarsus is feathered. Probably it belongs to some unnamed race, but I call it provisionally *javensis*.

*Measurements*.—*Western Java*, in Berlin Museum:—

| Sex | Locality   | Date    | Wing      | Shortest Rectrix | Longest Rectrix |
|-----|------------|---------|-----------|------------------|-----------------|
| ♂   | Cheribon   | 6-10-27 | 111       | 44               | 49 (27.1187)    |
| ♂   | "          | 6-10-27 | 114       | 43               | 49.5 (27.1186)  |
| ♀   | "          | 6-10-27 | 117       | 47               | 53 (27.1189)    |
|     | Buitenzorg | 3-11-25 | 115       | 43               | 50 (26.32)      |
|     | "          | 3-11-25 | 116       | 46               | 53 (26.31)      |
| ♂   | Krawang    | 2-25    | 109       | 43               | 49.5 (25.1887)  |
|     |            |         | 109 - 117 | 43 - 47          | 49 - 53         |

*Kangean Islands*: E. Prillwitz leg., No. 245, in Tring Museum:—

117      43      52

*Western Flores*: Mboera, in Buitenzorg Museum:—

108      41      49

### *Collocalia francica bartelsi*, Stres.

Like *C. francica javensis*, but of greater size. Wing of type 122 mm. Breeding places probably off the North coast of West Java (cf. Ornithologische Monatsberichte, 1927, p. 46).

### *Collocalia francica micans*, Stres.

*Collocalis fuciphaga* (!) *micans*, Stres., I, p. 6 (Savu Id.) and II, p. 186.

*Diagnosis*.—Tarsus without any, or with very few feathers on the outer side. Upperside, including rump, as in *javensis* (sometimes rump concolorous with back); underside as pale as in *germani*, i.e., lighter than in *javensis* and *vestita*.

*Distribution*.—Sumba, Savu, Timor; specimens from Makassar mentioned in the original description should be re-examined.

*Measurements*.—*Sumba*, 8-5-1925, Dr. K. W. Dammerman leg., in Buitenzorg Museum:—

| Sex | Wing | Shortest Rectrix | Longest Rectrix | No.  |
|-----|------|------------------|-----------------|------|
| ♀   | 108  | —                | 47              | 5206 |
| ♀   | 108  | —                | 49              | 5207 |
| ♀   | 114  | —                | 50              | 5203 |
| ♀   | 114  | —                | 51              | 5204 |

*Savu*, 8-9-1896, A. H. Everett leg., in Tring Museum:—

|   |     |    |                             |
|---|-----|----|-----------------------------|
| ♂ | 114 | 43 | 51 (type of <i>micans</i> ) |
| ♀ | 113 | 45 | 53                          |

### *Collocalia (francica?) aenigma*, Riley.

*Collocalia vestita aenigma*, Riley, 1918 (Northern Central Celebes: Parigi); *Collocalia fuciphaga aenigma*, Stres., Orn. Monats., 1931, p. 13 (Central Celebes: Uru).

This race was recently treated by myself as a race of *fuciphaga*, because I took the white-rumped species with which it occurs at the same spot in Central Celebes to be a representative of *C. francica*. Since then I received through the courtesy of Dr. A. Wetmore and Dr. H. Friedmann four of the specimens on which Riley based his description. These birds have tails comparatively short, too short I think to be regarded as representing a race of the long-tailed *fuciphaga*, and they are at the same time so similar to the Bornean *C. francica vestita* that I am now inclining to treat *aenigma* as a race of *francica*. If this view is correct then "*Collocalia francica sororum*", inhabiting the same part of Celebes, and even breeding in the same cave near Uru, can no longer stand as a race of *francica* and deserves specific rank, its affinities being quite obscure.

*Diagnosis*.—*C. (francica?) aenigma* has the tarsus naked or with some little feathers on the outside. It is distinguished from *C. fuciphaga fuciphaga* by its shorter tail; by having the upperside, wings and tail much darker with the gloss more bluish, less greenish; underside much lighter and more silvery, less brownish; feathers of abdomen with strong dark shaft-lines, which are lacking in *C. fuciphaga fuciphaga*; inner edges to the remiges very dark; rump concolorous with back.

The differences between *C. (francica?) aenigma* and *C. francica vestita* chiefly consist in the more scanty feathering of the tarsus in the former, in its darker upperside, which has a more bluish, less greenish gloss, and in that the underside averages paler, more silvery, less brownish.

*Distribution*.—Central Celebes.

*Measurements.*—Latimodjong range: Uru, 800 m., 12-8-30. G. Heinrich leg., No. 1504, in American Museum of Natural History:—

| <i>Sex</i>   | <i>Wing</i>     | <i>Shortest<br/>Rectrix</i> | <i>Longest<br/>Rectrix</i> |                             |                            |            |
|--|-----------------|-----------------------------|----------------------------|-----------------------------|----------------------------|------------|
| ♂  | 123             | 47                          | 54                         |                             |                            |            |
| <i>Northern Central Celebes, H. Raven leg., in U. S. National Museum:—</i> |                 |                             |                            |                             |                            |            |
| <i>Sex</i>   | <i>Locality</i> | <i>Date</i>                 | <i>Wing</i>                | <i>Shortest<br/>Rectrix</i> | <i>Longest<br/>Rectrix</i> | <i>No.</i> |
| ♀  | Pinedapa        | 13-2-18                     | 118                        | 43                          | 50                         | 251925     |
| ♂  | „               | 13-2-18                     | 122.5                      | 42                          | 48                         | 251923     |
| ♀  | Gimpoe          | 29-8-17                     | 121                        | —                           | 51                         | 251928     |
| ♂  | „               | 1-8-17                      | 122                        | 47                          | 51                         | 251926     |

## II. *Collocalia sororum*, Stres.

*Collocalia francica sororum*, Stresemann, Ornith Monatsber, 39, p. 12 (1931—Central Celebes: Uru).

*Diagnosis.*—Tarsus more or less feathered; underside very pale, more silvery and less brownish than even in *C. francica germani*; upperside and wings much darker than in all the western races of *C. francica* (except *C. aenigma*, which is nearly as dark), and with much more bluish, less greenish gloss. A narrow greyish white rump band with dark shafts contrasts very sharply with the back, being even more pronounced than in *C. francica germani*.

When treating *C. (francica?) aenigma* I discussed my reason for regarding this form as specifically distinct from *C. francica*.

Nests are made largely from moss (Mr. Heinrich in litteris).

*Distribution.*—Foothills of the Latimodjong range in Central Celebes.

*Measurements.*—Wing 107–115 mm.

Uru, Latimodjong range, 12-8-30. G. Heinrich leg., in Berlin Museum and American Museum of Natural History:—

| Sex | Wing | Shortest Rectrix | Longest Rectrix | No.  |
|-----|------|------------------|-----------------|------|
| ♀   | 107  | 43               | 48              | 1522 |
| ♂   | 108  | 42               | 48              | 1488 |
| ♂   | 109  | 41               | 47              | 1512 |
| ♀   | 109  | 41               | 47              | 1495 |
| ♂   | 109  | 41               | 47              | 1518 |
| ♂   | 112  | 44               | 51              | 1484 |
| ♂   | 112  | 44               | 50              | 1493 |
| ♀   | 112  | 45               | 50              | 1494 |
| ♀   | 113  | 43               | 49              | 1496 |
| ♂   | 113  | 42               | 49              | 1482 |
| ♂   | 114  | 43               | 48.5            | 1487 |
| ♀   | 114  | 44               | 52              | 1483 |

## III. *Collocalia fuciphaga*.

Owing to the gaps in our knowledge it is difficult to say how far the distribution of this species may extend. The true *C. fuciphaga fuciphaga* seems to be restricted to Java. From the Lesser Sunda Islands I have seen hitherto only races of *francica*, but not a single *fuciphaga*. Among nearly 200 swiftlets from Borneo, which came from different parts of the island, no representative of *fuciphaga* has been found by myself. If this species should not be restricted to Java, then *Collocalia innominata* Hume may be its western representative. The reason for this opinion is the agreement in size (larger than *francica*, smaller than *lowi*) and the agreement in the form of the tail, which is long and deeply furcated and fundamentally different from the tail of *C. lowi* and its races.

The differences between *fuciphaga* and *innominata* seem to be of lesser importance: tarsus naked in the former, feathered in the latter form; rump concolorous with the back in the former, decidedly lighter than the back and of a smoky grey colour in the latter: but as there have not yet been found intergradations between the two and as the breeding habits of both are still insufficiently known my opinion has no other value than that of a hypothesis. Should one be disinclined to regard *innominata* as a race of *fuciphaga*, then it is very questionable if it is correct to regard the analogue races from the Moluccas (*moluccarum* Stres.), and from Papuasias as races of *fuciphaga*, and the natural consequence would be to split up the whole group into several species. I am now inclined to believe that *innominata* is represented in the north-west by *brevirostris* and in China by *inopina*.

*Collocalia fuciphaga fuciphaga* is said to build the nest as a rule from moss fixed on the rock with saliva.

## *Collocalia fuciphaga fuciphaga* (Thunberg).

Synonym.—*Hemiprocne salangana*, Streubel, 1848 ("Ostisdien" = Java), type in Zoological Museum, Berlin. *Collocalia fuciphaga*, Stres., I, p. 4; II, p. 186.

*Diagnosis.*—Tarsus naked (perhaps sometimes with some small feathers?); rump concolorous with back; underside darker and more brownish than in *C. francica javensis*; tail relatively longer; size greater.

*Distribution.*—Java only. A specimen regarded in my first paper (I, p. 5) as of Sumatran origin came from Java, the type locality Lebak being situated in western Java, Residency of Bantam. Kangean, too, had been erroneously included by myself in the range of *fuciphaga*; a re-examination of the Kangean skin proved that it belongs to *C. francica javensis* or a very similar *francica* race.

Measurements.—Java, Fruhstorfer leg., in Berlin Museum:—

| Wing  | Shortest Rectrix | Longest Rectrix |
|-------|------------------|-----------------|
| 116   | 48               | 56              |
| 117   | 47               | 54              |
| 119   | 47               | 55              |
| 120.5 | 50               | 58              |

Gunong Gedeh. 2-5,000 feet, E. Prillwitz leg., in Tring Museum:—

| Sex | Wing | Shortest Rectrix | Longest Rectrix |
|-----|------|------------------|-----------------|
| ♂   | 115  | 50               | 54              |
| ♀   | 118  | 46               | 54              |
| ♂   | 120  | 48               | 55.5            |
| ♀   | 121  | 46               | 56              |

Type of *Hemiprocne salangana* Streubel, Java, through Temminck:—

|     |    |    |
|-----|----|----|
| 120 | 49 | 55 |
|-----|----|----|

#### *Collocalia (fuciphaga?) innominata*, Hume.

*Collocalia brevirostris innominata* pt., Stres., III, p. 351.

The type of *Collocalia innominata* Hume, collected in the Andamans, is probably a straggler. Mr. Kinnear, who kindly compared it with some of the races which I call *C. (fuciphaga?) innominata* and *C. lowi robinsoni* in this paper, informed me that the type belongs to the former, though it has a somewhat heavier bill.

**Diagnosis.**—Upperside, wing, tail and underside very similar to *C. francica germani*; rump distinctly paler than the back in opposition to *C. fuciphaga fuciphaga*. Inner edges of wing very pale, paler than in *fuciphaga*. Underside nearly as pale as in *C. (francica?) acnigma*, but somewhat more brownish, with dark shaftlines on the abdomen; tarsus feathered.

**Distribution.**—Malay Peninsula. The only skin at hand which might prove that *innominata* occurs in Sumatra (collected at the cave of Buo, Padang Highlands, by E. Jacobson),<sup>1</sup> has the central pair of tailfeathers in moult, and the outer pair is shorter than in any Malayan specimen. I am not at all convinced that it represents the true *innominata*. More material from Sumatra is badly wanted).<sup>2</sup>

<sup>1</sup> *Collocalia innominata*, Rob. and Kloss, Journ. Fed. Malay States Mus., IX, 1924, p. 243.

<sup>2</sup> The skin recorded as *C. innominata* by Robinson and Kloss, Journ. Straits Branch Roy. Asiat. Soc., No. 80, 1919, p. 90, proved after examination to be *C. lowi lowi*, vide *infra*, p. 97.

Measurements.—Southern Malay Peninsula, in Raffles Museum:—

| Sex | Locality             | Date     | Wing  | Shortest Rectrix | Longest Rectrix |
|-----|----------------------|----------|-------|------------------|-----------------|
| ♂   | Kledang Hill (Perak) | 19-11-27 | 123   | 43               | 55              |
| ♂   | "                    | 26-11-27 | 124.5 | 44               | 56              |
| ♂   | "                    | 20-11-27 | 127.5 | 46.5             | 56              |
|     | G. Mengkuang Lebah   | 10- 3-07 | 126.5 | 45.5             | 54              |
|     | " 4,800 ft.          | 3-07     | 127   | 45               | 57              |
|     | "                    | 3-07     | 128   | 48               | 56.5            |
|     | Semangko Pass        | 2-04     | 127   | 43               | 55              |
|     | "                    | 17- 2-04 | 129   | 47.5             | 56              |
|     | Larut Hills (Perak)  | 16-12-11 | 132   | 49.5             | 57.5            |
|     | Taiping (Perak)      | 16-12-11 | 127   | 47               | 55              |
|     | One Fathom Bank      | 2-12-19  | 125.5 | 47               | 57              |
|     | " (Selangor)         | 27-11-19 | 130   | 46               | 57.5            |

#### *Collocalia (fuciphaga?) inopina*, Thayer and Bangs.

*Collocalia brevirostris inopina* and *Collocalia brevirostris pellos*, Stres., III, p. 351.

**Diagnosis.**—Similar to *innominata*, but larger and rump much darker, nearly concolorous with back; tail more furcated; tarsus densely feathered.

**Distribution.**—Mountains of Western China: Hupeh and Sechuan.

**Measurements.**—Wa Shan, Sechuan, 31-5-08, W. R. Zappey leg., Mus. Berlin, No. 25-53:—

| Sex  | Wing | Shortest Rectrix | Longest Rectrix |
|--|------|------------------|-----------------|
| ♂  | 136  | 52               | 62              |
| Omi Shan: (Sechuan) 15-5-15, Dr. Weigold leg., in Dresden Museum:— |      |                  |                 |
| ♀  | 133  | 51               | 59              |
| ♀  | 139  | 51               | 62              |

#### IV. *Collocalia lowi*.

In my last revision (III, p. 353) I treated *C. lowi* as a subspecies of *C. brevirostris* which inhabits the Himalayas. At present, however, I prefer not to express any opinion about the relations of *brevirostris* to any of the species inhabiting Malaysia and I shall



only deal with the forms, which resemble each other in a higher degree. These are: (1) *lowi*, (2) *l. tichelmani*, (3) *l. robinsoni*. Probably *Collocalia vulcanorum* also belongs to this group: it is unfortunate that I am now unable to compare this form with *lowi*, all the skins known being in Java in Mr. Bartels' collection.

This group is characterized by its relatively short tail which is nearly square, or at least only slightly furcated. Furthermore, the forms of *lowi* can be distinguished by size; they are more heavily built than the *fuciphaga* races and are the largest swiftlets with exception of the gigantic *C. gigas*. The nests of *C. l. lowi* and *l. tichelmani* consist of layers of saliva mixed with many feathers (so-called "black" nests), the region of attachment to the rock being very often more or less of a red colour. The nests of *C. lowi tichelmani* always contain one egg only, not two.\*

### *Collocalia lowi lowi*,

*Collocalia lowi lowi*, Stres., I, p. 10; *Collocalia brevirostris lowi*, Stres., III, p. 353.

**Diagnosis.**—Tarsus densely feathered. Upperside very dark, rump concolorous with back or a little paler; tail short and nearly square.

**Distribution.**—West and North Borneo; Sumatra.

**Measurements.**—Wing 125–140 mm.

**North Borneo**, in Raffles Museum.

Pusu Suring (Baturong).

| Sex | Wing | Shortest Rectrix | Longest Rectrix | No. |
|-----|------|------------------|-----------------|-----|
| ♂   | 132  | 45               | 47              | 190 |
|     | 133  | 47               | 49              | 187 |
|     | 134  | 45               | 46              | 189 |
|     | 134  | 48               | 50.5            | 185 |
|     | 135  | 47               | 48              | 188 |

Serob Gaja (Baturong).

|   |       |    |    |  |
|---|-------|----|----|--|
| ♂ | 132.5 | 45 | 47 |  |
|---|-------|----|----|--|

Pusu Samang Alang (Pidtong).

|   |     |    |    |  |
|---|-----|----|----|--|
| ♀ | 140 | 47 | 50 |  |
|---|-----|----|----|--|

Madai Cave.

|   |     |    |      |     |
|---|-----|----|------|-----|
| ♂ | 130 | 47 | 48.5 | 318 |
| ♀ | 132 | 45 | 49   | 317 |

Pidtong (Madai).

|   |     |    |    |     |
|---|-----|----|----|-----|
| ♂ | 132 | 46 | 49 | 289 |
| ♂ | 133 | 47 | 49 | 291 |

\*cf. E. Stresemann, Ornith Monatsberichte, 1926, p. 104–108.

Gomanton, Kinabatangan River, F. N. Chasen leg., 19-7-29.

| Sex | Wing  | Shortest Rectrix | Longest Rectrix | No. |
|-----|-------|------------------|-----------------|-----|
| ♂   | 125   | 41               | 44              |     |
| ♀   | 128.5 | 43               | 46              |     |
| ♂   | 129   | 42               | 48              |     |
| ♀   | 129   | 45               | 49              |     |
| ♀   | 130   | 44               | 48              |     |
| ♀   | 131   | 45               | 48              |     |
| ♂   | 131   | 42               | 44              |     |
| ♂   | 132   | 46               | 48              |     |
| ♀   | 132   | 47               | 49              |     |
| ♀   | 135   | 47               | 49.5            |     |

Sumatra.

Padang Highlands:

Muara Labu, 480 m., 19-7-14, E. Jacobson leg., in Leiden Museum.

|   |     |    |      |  |
|---|-----|----|------|--|
| ♂ | 127 | 50 | 53.5 |  |
|---|-----|----|------|--|

Batu Sankahar, 1,800 feet, 2-1-89, E. Hartert leg., in Berlin Museum.

|   |     |    |    |  |
|---|-----|----|----|--|
| ♀ | 132 | 48 | 49 |  |
|---|-----|----|----|--|

District Deli, Polonia, 4-8-16, van Heyst leg., No. 818, in Tring Museum (recorded as *Collocalia innominata* Hume, by Robinson and Kloss, Journ. Straits Branch Roy. Asiat. Soc., No. 80, 1919, p. 90).

|   |     |    |    |  |
|---|-----|----|----|--|
| ♂ | 129 | 44 | 48 |  |
|---|-----|----|----|--|

### *Collocalia lowi tichelmani*, Stres.

*Collocalia brevirostris tichelmani*, Stres., III, p. 351.

**Diagnosis.**—Like *C. l. lowi*, but somewhat smaller; rump averaging somewhat paler.

**Distribution.**—South-eastern Borneo.

**Measurements.**—Cave of Tamaluang, 4-3-26, G. L. Tichelman leg., in Berlin Museum.

| Wing    | Shortest Rectrix | Longest Rectrix |
|---------|------------------|-----------------|
| 120 + x | 43.5             | 46.5            |
| 122     | 44               | 47              |
| 122 + x | 43               | 47              |
| 123 + x | 42               | 44.5            |
| 125     | 43.5             | 45              |
| 129     | 45               | 49              |



**Collocalia lowi robinsoni**, subsp. nov.

Type in Raffles Museum, No. 3702: Pulau Belitung, S. W. of Terutau Island, West Coast of the Malay Peninsula, H. C. Robinson leg. (*C. innominata* Robinson, Journ. Fed. Malay States Mus., VII, 1917, p. 154).

*C. brevirostris innominata* pt. Stres., III, p. 153.

**Diagnosis.**—Tarsus feathered; rump paler than back; inner margins of remiges lighter than in *C. l. lowi*. Very similar to *C. (fuciphaga?) innominata*, but more strongly built; bill averaging larger; feet averaging stronger; primaries and secondaries a little broader; inner margin of remiges darker; tail relatively shorter and less furcated.

**Distribution.**—Coasts of Tenasserim (Mergui and Bankasoon, in British Museum), Peninsular Siam and Malay States.

**Measurements.**—Pulau Belitung (S.W. Terutau), H. C. Robinson leg., 21-22-12-16, in Raffles Museum:—

| Sex | Wing | Shortest<br>Rectrix | Longest<br>Rectrix |
|-----|------|---------------------|--------------------|
| ♀   | 130  | 48                  | 51                 |
| ♂   | 133  | 46                  | 47                 |

Gunung Angsi (Negri Sembilan) 28-29-11-23, F. N. Chasen leg., in Raffles Museum:—

|   |     |      |      |          |
|---|-----|------|------|----------|
| ♀ | 126 | 43.5 | 47   | (No. 55) |
| ♂ | 131 | 47   | 52.5 | (No. 51) |

Named in commemoration of the late Mr. Herbert C. Robinson, whose work on the ornithology of Malay Peninsula will endure for long time.

**Collocalia (lowi?) vulcanorum**, Stres.

*Collocalia brevirostris vulcanorum*, Stres., III, p. 352.

**Diagnosis.**—Tarsus feathered; rump nearly concolorous with back. Inner margins of remiges nearly as dark as in *lowi* and *tichelmani*.

**Distribution.**—Java: on the craters of the volcanoes Gedeh, Tankoeban Prahu and Papandajan.

**Measurements.**—Wing 118-124.5 mm.

## SWIFTLETS (COLLOCALIA) OF MALAYSIA AND ADJACENT SUBREGIONS

TABLES SHOWING THE DIFFERENCES BETWEEN THE SPECIES BREEDING IN THE SAME AREAS.<sup>1</sup>

**Malaysian subregion.****Malay Peninsula**

- C. francica germani* (North) The smallest species, wing 113-121 mm. Tail deeply furcated (central pair of rectrices 41-46, longest pair 47-53 mm.). Tarsus naked in the northern region (*germani*), naked or feathered in the south (*germani* >< *vestita*). Rump always paler than back in the north, mostly paler than back in the south. "White" nests.
- C. francica germani* >< *vestita* (South).
- C. (fuciphaga?) innominata* Darker than *francica*, wing 123-132 mm. Tail deeply furcated (central pair of rectrices 44-49.5 longest pair 55-57.5 mm.). Tarsus always feathered, rump distinctly paler than back. Nests unknown.
- C. lowi robinsoni* ... Very similar to *C. fuciphaga innominata* with regard to coloration and wing length (wing 126-133 mm.), but more heavily built. Tail less deeply furcated (central pair of rectrices 43.5-48 mm., longest pair 47-51.5 mm.). Inner edges to the primaries and secondaries apparently darker. Nests unknown.
- C. gigas* ... By far the biggest species; wing 157-162 mm.

**Borneo**

- C. francica vestita* ... Wing 113 (S. E. Borneo); 127 mm. (N. Borneo). Tail furcated (central pair of rectrices 42-48, longest pair 45-51 mm.). Rump concolorous with back. Tarsus feathered as a rule, seldom naked. "White" nests, containing two eggs.

1. The smallest and differently coloured species, *C. esculenta*, has not been considered in this list.

- C. lowi lowi* (N. & W. Coast) ... Wing 125 - 140 mm. Tail relatively short and nearly square (central pair of rectrices 42 - 48, longest pair 44 - 50.5 mm.). Rump concolorous with back or a little lighter than the latter. Tarsus densely feathered. More heavily built than *francica* (*C. lowi tichelmani* agrees with *C. lowi lowi*, but is somewhat smaller: wing 122 - 129 mm.). "Black" nests, containing one egg only.

## Sumatra

- C. francica vestita* ... Wing less than 125 mm. Tail furcated (central pair of rectrices 43 - 48.5, longest pair 48 - 52 mm.). Rump concolorous with back. Tarsus feathered as a rule, seldom quite naked. "White" nests, containing two eggs.
- C. lowi lowi* ... Wing more than 125 mm. Tail relatively short and nearly square (central pair of rectrices 44 - 50, longest pair 48 - 53.5 mm.). Rump concolorous with back or a little lighter than the latter. Tarsus densely feathered. More heavily built than *C. francica vestita*. Nests probably as in Borneo.
- C. gigas* ... By far the biggest species: wing 157 - 162 mm.

## Java

- C. francica javensis* ... Wing 109 - 117 mm. (*javensis*) or up to 122 mm. (*bartelsi*). Tail furcated (central pair of rectrices 43 - 47, longest pair 49 - 53 mm.). Rump appreciably lighter than back. Tarsus mostly more or less feathered. "White" nests.

- C. fuciphaga fuciphaga* ... Wing 116 - 121 mm. Tail relatively longer than in *francica* (central pair of rectrices 46 - 59 mm., longest pair 54 - 58 mm.). Tarsus naked. Rump concolorous with back. Upperside darker and more brownish less greenish than in *francica*. Underside a little darker than in *francica*. Nests apparently black.
- C. (lowi?) vulcanorum* ... Wing 118 - 124.5 mm. Tail slightly furcated. Tarsus feathered. Rump nearly concolorous with back. Heavily built.

- C. gigas* ... By far the biggest species: wing 157 - 162 mm.

## Austro-Oriental subregion.

## Central Celebes

- C. sororum* ... Wing 107 - 115 mm. Tail furcated (central pair of rectrices 41 - 45, longest pair 47 - 52 mm.). Rump forming a nearly pure white band, sharply contrasting with the back. Nests largely made from moss.
- C. (francica?) aenigma* ... Wing 118 - 123 mm. Tail furcated (central pair of rectrices 43 - 47, longest pair 48 - 54 mm.). Rump concolorous with back. Nests unknown.